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that, so far as real biological teaching in this country is concerned, the zoölogists were the pioneers, is it less to the credit of American botanists that they could escape from the old traditions and recognize the vivifying influence of the new ideas? It is true, perhaps, that American botanists have hardly yet recognized the full applicability of what are called "zoölogical methods" to the solution of many of their own problems; but is that any reason why zoölogists should calmly assume that all the necessary data for biological generalizations are to be derived from animal sources? May it not be suggested to the (animal) "biologist" who does condescend to demonstrate to his class the streaming of protoplasm in *Nitella* or karyokinesis in the root-tip of an onion, that this slight recognition of the superiority of vegetable tissues for the study of vital phenomena might well be carried much further if he but knew it.

That there are many colleges where botany is a mere species grind, we all know too well, but, is our "prominent zoölogist" so guileless as to imagine that there is none of the quality of a boomerang in such a statement? If so, I beg to assure him that there are colleges of repute, yes, and "universities," where botany is well taught, while the zoölogy is a round of counting scales or tail-feathers; and there are still others where, as between the two, the choice is that of "the devil or the deep sea."

The GAZETTE's complaint is a very timely and just one. I have heard one of the leaders of American zoölogy remark upon this very condition of things to the effect that he could not understand why botanists remain silent while chairs of biology are repeatedly filled with zoölogists pure and simple, whose teachings, if not their conceptions, of biology are wholly one-sided. And he added, "If I were a botanist, I should be heard from." But, if some one says he can do better by himself and by his students if he confines his work to the animal kingdom, we shall have no quarrel. I believe it is best for the occupant of a chair of biology to be either a zoölogist or a botanist, for the obvious reason that it is best for a man to teach well what he teaches. The wrong thing is that there should be chairs of biology. It is absurd to expect a man to cover the field of modern biology. Yet, in how many institutions where no one would think of expecting one man to teach physics and chemistry or English literature and rhetoric, must one man stagger under that load.

If there is money to employ but one man, make the best of it and see that zoölogy or botany is well taught, but don't delude your students with the idea that they are to become biologists in a term. In the name of common honesty and sound ideas let us "call a spade a spade," and not a subsoil plough.

JAMES ELLIS HUMPHREY.

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Mounting plants.

Some articles in the BOTANICAL GAZETTE of October called attention to establishment of "Biological Surveys," and the editors made some very striking remarks concerning the present stage of our botanical explorations; "that botanists should consider plants as biological problems more than specimens to be catalogued, etc." The great importance of Biological Surveys is only too clear, and although I do not intend to discuss this subject more than has already been done, I should like to call attention to a certain point, which undoubtedly ought to be taken in consideration, and which might form an additional remark to those of the editor's, mentioned above. It is merely in regard to the preservation of our herbaria. The specimens in the herbaria should not only be pre-

served so that they may show the habit of the plant, but also that they may be easily handled for examination. The time is long past when botanists are content with mere examination of the structure of the flower, the fruit, etc. The interior structure of the whole plant is far more important in these days. I do not think it necessary to recall the invaluable researches by Vesque, Radlkofer and several others, who have shown us the anatomical characters of plants. But in the manner in which the herbaria are preserved in our country, the specimens are not to be used for such a purpose. All the specimens in the U. S. National Herbarium in the Department of Agriculture are mounted on sheets in such a manner that the entire specimen has been glued and fastened to the paper. Hence the specimen can not be removed from the paper without being broken, and it is very clear that flowers with large petals and stamens can not be examined. For anatomical studies these specimens have lost the greatest part of their value; the covering of glands or hairs is disturbed by this method; and the stems and leaves can not be removed without being broken into pieces. And how about clusters of small flowers which we might want to examine? These are not at all to be removed. Might it not be time now to make a change in regard to the preservation of specimens? Unfortunately, as I have heard, this manner of preservation has been used in museums where the greatest collections are deposited. The new or rather very old and well-known method, which is to be recommended, is to mount the specimens with glued paper strips, which can easily be taken off so that the plant can be examined freely in the hand, and parts cut off which are wanted for examination. This is the general manner of preservation in Europe, and has been used with great success.

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THEO. HOLM.

CURRENT LITERATURE.

Minor Notices.

IN *Annals of Botany* (vol. iv. no. 15. Aug. 1890) Dr. F. W. Oliver has given an excellent anatomical study of *Sarcodes sanguinea*, accompanied by four double plates illustrating anatomical details, and a fifth very large one showing the whole plant with its coloration. Of course any member of the *Monotropeæ* is worthy of careful study, both on account of habit of growth and affinities. Naturally, interest somewhat centers about the root structures, for the plant proves to be a saprophyte or humus-plant. The roots are everywhere invested in a close-fitting sheath of "fungal-mycelium," well displaying, as in *Monotropa*, the mycorrhiza habit. Probably the most striking statement with regard to root structure is that all lateral roots have an exogenous origin! This habit seems to be in common with *Pterospora*, and the author considers it a special adaptation (a perpetuated advantageous variation) by which the formation of a wound in the cortex may be avoided, thus making the inner tissues less liable to the entry of the mycorrhiza fungus (although *Monotropa*, with the same mycorrhiza habit, has the usual endogenous branching). The stem, leaves, and morphology of the flowers are also considered. The development of the reproductive structures of the embryo sac is similar to that which has been fully described by Strasburger and Koch in the case of *Monotropa*.